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URBAN ENVIRONMENTAL
HEALTH AND HYGIENE IN
SUB-SAHARAN AFRICA

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Urban Environmental Health and Hygiene in Sub-Saharan Africa

by

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ABBREVIATIONS

AMREF	African Medical and Research Foundation, a voluntary agency in East Africa
GoK	Government of Kenya
HESAWA	A SIDA-funded health, sanitation and water supply project in Tanzania
IDRC	International Development Research Centre, Canada
LASF	Letrina Abonera Seca Familiar
NGO	Non-Government Organization
PHC	Primary Health Care
ROEC	Reid's Odourless Earth Closet, a ventilated pit latrine
SIDA	Swedish International Development Authority
VIP	Ventilated Improved Pit latrine
WHO	World Health Organization

Table 1. Basic statistical data on sub-Saharan Africa, India and Nicaragua

Country	GNP per caput 1992 (USD)	% population below absolute poverty level 1980-90'		Official dev. ass. received 1992 USD/caput	% urban population 1992	Annual urban growth rate (%) 1992-2000	Infant mortality rate 1992	% adult literacy rate 1992		% population with access 1988-91 ^a				Fresh water withdrawal 1980-91 m ³ /person/yr
		urban	rural					M	F	to safe water		to health services		
1. Angola	1,130	?	65	32	30	5.4	126	56	29	71	20	25	15	40
2. Botswana	2,790	30	55	86	30	7.9	35	84	65	98	46	100	85	100
3. Ethiopia	110	60	63	24	13	5.8	122	33	16	91	19	97	7	50
4. India	310	42	33	3	26	3.9	79	64	35	87	85	53	2	610
5. Lesotho	590	50	55	77	23	6.3	46	?	?	59	45	14	23	30
6. Kenya	310	10	55	31	25	7.0	66	82	60	74	43	69	35	50
7. Mozambique	60	40	65	92	30	7.2	162	46	21	44	17	61	11	50
8. Namibia	1,160	?	?	91	28	5.4	57		40	98	35	24	11	80
9. Nicaragua	340	21	19	166	61	4.1	56		78	78	20	79	60	370
10. Somalia	170	40	70	62	35	4.7	132	41	16	50	29	50	15	170
11. Sudan	480	?	85	23	23	4.8	99	45	13	55	43	89	65	1,090
12. Tanzania	110	10	60	48	22	7.5	92	93	88	65	45	74	62	40
13. Uganda	170	?	80	38	12	6.6	122	65	37	43	12	63	28	20
14. Zambia	290	47	80	118	51	5.5	107	83	67	70	28	75	12	90
15. Zimbabwe	570	?	60	69	30	5.4	47	76	61	95	14	90	80	130

^a "the level below which a minimum nutritionally adequate diet plus essential non-food requirements is not affordable"

Sources: UNICEF, The state of the world's children, 1993.

World Bank, World Development Report, 1994.

UNDP, Human Development Report, 1994.

Summary

Urban areas all over Africa, despite local and regional differences, have much in common: rapid population growth, more than half the population of large cities in squatter settlements, a public sector unable to provide basic services, and deteriorating environmental conditions.

Africa's urban population is expected to increase from 210 million in 1990 to 340 million in 2000. The number of urban dwellers without access to safe water is expected to increase from 26 million to 80 million. The number of people without access to an acceptable latrine will during the same period grow from 43 million to 90 million.

The Nordic donor agencies have traditionally concentrated their development assistance in the fields of health, water supply and sanitation to rural areas. In a longer term perspective we see three main policy options for the development assistance in these fields:

1. continued concentration on rural programmes;
2. continued strong support to rural development programmes, combined with an increased involvement in small and medium-sized towns; and
3. involvement in pure urban projects, also in large cities.

Our recommendation is that development efforts over the next decade should continue to give priority to rural development. In most sub-Saharan countries 70-90% of the population is rural. Even with current rapid urbanization rates this rural population will go on increasing for the next 30 years. Besides, rural Africa's health and hygiene problems are still largely unsolved: much remains to be done to increase the coverage, improve the functioning and generate sustainability of rural water supplies, most remains to be done on rural sanitation and virtually nothing has been done regarding control of disease vectors. We therefore recommend the second option.

However, as a preparation for a possible future urban involvement, the major donor agencies should monitor the health and environmental problems in urban areas and initiate/carry out a number of studies: on urban health, health care and health service inequities, a review of non-published data on morbidity and mortality statistics and health care utilization in different urban sub-populations, a study of on-site disposal and re-use of excreta, garbage and waste water at high population densities, and methods for small-scale, intensive food production in urban areas involving the re-use of excreta and waste water.

1. INTRODUCTION

Urban and peri-urban shantytowns with extreme crowding, poor housing quality and unsanitary environmental conditions are a growing health and social problem in sub-Saharan Africa and elsewhere in low-income countries. This situation is a result of several related processes.

Rapid population growth in combination with accelerating rural-urban migration of poor and under employed rural dwellers is increasing urban populations. Urban space is limited, planning and implementation capacity is poor and resources for infrastructure development are scarce. Population densities in low-income areas run out of control, settlements are established in unsuitable locations (riversides, steep slopes, close to hazardous industries etc.), and levels of air and water pollution are high and rising. Legal so called "low cost" housing is expensive for poor people. Illegally constructed houses are often the only affordable option, used by up to half of the inhabitants in many cities. Normal urban services such as water supply, garbage collection, excreta disposal, drainage, and electricity supply are rarely available in these settlements. Many cities are characterized by a colonial type discrimination: well-served residential areas for the rich and unserved or poorly served areas for the poor.

The sanitary and other environmental problems in the growing urban low-income settlements are tremendous. Slums, shantytowns and other low-income housing areas are high-risk environments with regard to illness and injury. Some of these settlements, e.g. on the outskirts of provincial and district towns, are geographically within areas covered by donor-supported programmes. There are good reasons for development assistance organizations to pay attention to problems in urban areas where 20-30 years from now about half of the people in most developing countries will reside.

We recently conducted a SIDA-commissioned a study of environmental hygiene problems in rural Africa¹ and were later asked to review the situation in urban low-income areas of sub-Saharan Africa. Much of the published literature in this field is highly technical and relatively narrow in

scope. Useful overviews have been published by WHO (1988 and 1991; Tabibzadeh et al 1989), by Hardoy and Satterthwaite (1989), by Rodwin (1987) and by the World Bank, for instance in documents prepared by Kalbermatten (1980) and by Feachem et al (1980). An annotated bibliography of IDRC- and World Bank-supported research on low-income shelter projects in El Salvador, Zambia, Senegal and the Philippines was published by IDRC in 1982. Ward has written a critical analysis of self-help housing programmes (1982). "A useful guide to literature" was published in the first issue of *Environment and urbanization* (Vol. 1, No. 1, April 1989). Other sources are mentioned in the text and specified under "References" at the end of this report.

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The views, interpretations and proposals in this report are those of the authors and should not be attributed to officials of SIDA.

¹ Nordberg, E and Winblad, U (1990): *Environmental hygiene in SIDA-supported programmes*. Report to SIDA, Stockholm.

2. POPULATION INCREASE AND URBAN GROWTH

The world's population is expected to reach 6,200 million by the year 2000. From early in the next decade over half will live in cities. By year 2025 the world's population is likely to be 8,200 million out of which 5,000 million are expected to be living in urban areas. Urban growth will be particularly fast in those Third World nations where already 1,300 million people live in urban centres. Conservative estimates indicate that more than 1,000 million people in cities throughout the world live in grossly inadequate housing; more than 100 million have no housing whatsoever (Hardoy et al 1990).

Growth has been particularly fast in sub-Saharan Africa where cumulative urban growth is calculated at 382% between 1972 and 2000. The environmental problems accompanying this growth have reached crisis proportions. Neither local nor central authorities are able to provide utilities and build houses to cope with the situation. Urban populations do get housed one way or the other but most of this growth takes place in unplanned, under-serviced shantytowns—"transitional urban settlements". Shantytowns

are by far the fastest growing parts of urban areas and in many cities the shantytown population is likely to double within the next 10 to 12 years. The problems this gives rise to may vary from one country to another but in spite of local and regional differences there are a number of identifiable urban conditions that have a degree of uniformity all over Africa. One of these is the lack of basic utility systems. Poor water supply, coupled with inadequate waste collection and no facilities for disposal of excreta, is a typical condition for most urban settlements in Africa.

Water scarcity is already a problem in some areas. By the year 2000 most countries of eastern and some of southern Africa will be water stressed "and eight of them will have arrived at absolute scarcity by 2025" (Falkenmark 1989).

Table 2 provides an overview of the projected development in urban and rural areas up to 2020—including the expected decline of the rural population in parts of the Third World from around 2015.

Table 2. *Estimated and projected total, urban and rural population by region or area, 1990-2020 (millions)*

Region or area		1990	2000	2010	2020
World total	total	5,246	6,122	6,989	7,822
	urban	2,234	2,854	3,623	4,488
	rural	3,012	3,268	3,366	3,334
Developing regions	total	4,036	4,845	5,658	6,446
	urban	1,357	1,904	2,612	3,425
	rural	2,679	2,941	3,046	3,021
Africa	total	645	872	1,158	1,468
	urban	210	340	528	766
	rural	435	532	630	702
Eastern Africa	total	196	272	373	484
	urban	42	77	133	206
	rural	154	195	240	278
Middle Africa	total	69	92	122	154
	urban	27	44	67	95
	rural	41	48	55	59
Southern Africa	total	42	55	69	8
	urban	23	33	45	60
	rural	19	21	23	24

Source: Tabibzadeh et al (1989)

More than half of the urban population lives in small and middle sized (intermediate) towns. The proportion for Kenya in 1979 was 49.5%, for

Sudan in 1973 69% and for Tanzania in 1978 65.9%. Definitions of "urban", "small" and "intermediate" vary, however, and may not be

applicable world-wide. For African conditions a minimum population of 2,000 or 2,500 appears to be a useful and common definition, but in any given country various authorities may apply different criteria (such as "being a chartered municipality" or "having at least one hotel, a permanent shop and a weekly market"), and they may also be changed over time (Baker 1990). An upper limit at 20,000 people for small towns and

250,000 for intermediate towns have been suggested by Hardoy and Satterthwaite (1989).

Table 3 reflects the ongoing rapid growth of some African cities while Table 4 shows the shantytown population around 1980. Table 5 summarizes urban growth 1975-2000 by region.

Table 3: The growth of some African cities

	Population in millions			City's pop. (1980) as % of national pop. urban pop.	
	1950	1980	2000		
Cairo	2.5	7.4	12.9	17.6	38.6
Addis Ababa	0.2	1.7	5.8	5.2	36.6
Nairobi	0.1	1.3	5.3	7.9	57.3
Kinshasa	0.1	3.1	8.0	11.0	28.0

Source: Rossi-Espagnet 1984

Table 4: Percentage of urban poor in substandard housing with inadequate or no services, 1980

Angola	44-60%
Ethiopia (Addis Ababa)	79%
Kenya (Nairobi)	40%
Lesotho	59%
Malawi	80%
Mozambique (Maputo)	80%
Sierra Leone	80%
Somalia (Mogadishu)	60-80%

Source: Tabibzadeh et al 1989

Most urban population growth is due to natural increase. According to Preston (1988) about 1/3 of the urban population growth in developing countries is due to rural-urban migration, except in Africa where the proportion is likely to be higher. A study for Thika in Kenya (Kamba et al 1983) showed that 5% out of a total growth rate of 8% was due to migration.

Table 5: Cumulative urban growth 1975-2000 by region

Area	tot.urb.pop. in 1975 (millions)	increase 1975-2000	
		(millions)	%
Less dev.regions	838.4	1,283.7	253
Northern Africa	38.2	71.6	287
Sub-Sah. Africa	66.0	185.9	382

Source: Donohue 1982

Migration seems to be increasingly a "push" effect resulting from rural people having insufficient land and no stable employment and therefore leaving to explore the opportunities in urban areas. It is not so much a "pull" to expected job opportunities or other greener pastures in peri-urban shantytowns (Tabibzadeh et al 1989),

although a certain degree of urban (Lipton 1977) or large city bias (Hardoy et al 1984) due to the political influence of the elevated urban few with over-subsidizing of urban dwellers, does help make cities attractive.

Most developing countries appear keen to slow down the rural-urban migration process because of the inadequate urban infrastructure, the shortcomings of the existing public services, the environmental stress etc. (UN 1981). Efforts to deal with these problems have been made, and four prominent approaches (Tabibzadeh 1989) are summarized below:

- to improve social and economic conditions in rural areas through agrarian reforms, labour and tax policies etc.
- to control migration through legislation, including forced residence at work points, slum removal, and obligatory resettlement.
- to redistribute the rural population within the rural areas.
- to accommodate migrants in urban areas through housing projects, "sites and services" schemes etc.

So far no Third World country has really succeeded in preventing large scale rural-urban migration through any of these approaches. In some cases the effect has been the opposite, thus aggravating urban environmental health and hygiene conditions.

3. HEALTH AND ILLNESS

Low-income groups in urban areas are standing with one foot in a traditional society and one in a developing industrialized environment. Their health problems stem from both—a mix of undernutrition, infections, intestinal parasites, urban pollution, STDs, and accidental injuries associated with unsafe workplaces, just to take a few examples.

Health status differences between the urban poor and the rural poor are a matter of much debate. It is widely agreed that malnutrition tends to be more common among the urban poor, partly because they usually cannot maintain a kitchen garden and because food prices in towns tend to run away from most salaries (Nelson and Mandl 1978). Early weaning, excessive dilution of powdered milk, and too few meals per day also contribute.

The health status of urban dwellers in developing countries is on the average better than that of rural dwellers. But averages are misleading and the urban poor are in a health situation much similar to low-income groups in rural areas and possibly worse. Certain urban subgroups, such as the unemployed, the homeless, children in single-parent households, single or divorced women with small children and the unsupported elderly, tend to fare particularly badly as they are exposed both to rural health risks (infections, malnutrition, poor access to care when needed) and to harmful factors associated with urban life (environmental pollution, crowding, sexually transmitted disease, accidents).

Unfortunately data are scarce, of doubtful quality and poorly standardized, which complicates comparisons between communities and countries. A review has recently been published by Harpham and Stephens (1991) who reject to notion that the urban poor are marginalized in third world cities. They summarize published and some unpublished literature on urban health in all parts of the third world, including Africa.

Many of the very low-income squatter areas are formally "illegal" which is an excuse for excluding them from maps, survey sampling frames and service distribution systems (WHO 1991). It is not surprising, therefore, that few data exist. The bulldozer approach temporarily wipes out groups of dwellings, destroys communities under formation as well as private property, frustrates local efforts to coordinate

community development and thus undermines attempts to improve health and health care.

A few comments regarding selected disease categories:

Diarrhoea is very common, particularly in children aged 6 to 36 months, and is often severe. The number of episodes may be 5-8, and occasionally up to 12 (Bhatnagar 1986), per year per child in very poor households. Episodes are particularly severe in malnourished children. Diarrhoea is a major killer among small children and only a small proportion of all cases are seen at health care facilities. Diarrhoea may be caused by a large number of different micro-organisms, most of which are transmitted via water and food. Use of contaminated drinking water and poor sanitary arrangements are associated with high incidence of diarrhoea.

Upper respiratory infections may be caused by a variety of viruses and bacteria and are associated with crowding, air pollution and dampness. They are also very common, and 8-10 episodes annually per person are not unusual in children below five years of age. Most episodes are mild and of short duration but complications such as pneumonia occur and are more likely among the malnourished. Crowding and poor indoor air quality increase the risk of transmission, and low-cost firewood is far more polluting than kerosene and butagaz (Smith 1987). These infections are likely to be more severe as well as more common in low-income urban areas (Guimaraes et al 1985). Short breast-feeding periods in urbanized households contribute to high incidences of respiratory as well as other infections.

Tuberculosis, especially lung tuberculosis, often spreads within households and cause serious disease, particularly in malnourished or otherwise weakened individuals. Crowding facilitates transmission and immunization provides only partial protection. Poor slum dwellers are at high risk, and early diagnosis and treatment is unlikely due to high cost of curative care in urban areas. Individuals with impaired immune defence systems, such as HIV-positives, are particularly vulnerable to tuberculosis developing into severe illness, and urban areas with high levels of HIV seropositivity also tend to have high and rising rates of tuberculosis. Crowded and poorly ventilated, polluted work-sites become high-risk envi-

ronments whenever one or more individuals with open lung tuberculosis enter the work-force.

Sexually transmitted diseases are common in urban areas and along major transport routes. Gonorrhoea is estimated to be 10-40 times more common in Sub-Saharan communities than in industrialized countries, and the incidence in large African cities is believed to be 3,000-10,000 per 100,000 people per year (De Schryver & Meheus 1990). Early diagnosis and treatment—important to avoid complications such as sterility and to prevent transmitting the infection to others—is expensive, and poor patients often try to save by self-medication or buying antibiotics from pharmacies and street vendors with unsatisfactory result. AIDS is a growing problem with a high mortality rate, and the incidence is particularly high among promiscuous adults with high rates of other STDs, several of which appear to increase the risk of HIV transmission. This has made the incidence of AIDS climb rapidly in urban areas. A 1986 survey in Rwanda showed HIV seropositivity at 17.8% in urban and 1.3% in rural dwellers (Bizimungu et al 1989) and surveys in Uganda have shown similar rates: 15% in Kampala and 1.4% in West Nile (Carswell et al 1986) which illustrates the shortcomings of national statistical averages. A recent analysis estimated that 4% of the national adult population was infected, and 15% of the urban adults (Hunter 1993). These urban-rural discrepancies are likely to slowly decline over time while rates of seropositivity and AIDS incidence continue to climb.

Other infectious diseases include skin infections which are common where personal hygiene is unsatisfactory due largely to poor access to water. Eye infections are common under similar conditions although rarely serious. Pneumonia is often a complication following upper respiratory infections and may be serious, particularly if effective treatment is delayed. Parasitic diseases are also common in Third World cities, partly because of poor personal and public hygiene, but partly also due to a continuous immigration of infected individuals from rural areas where the disease is endemic. Meningitis is more easily transmitted in crowded homes and institutions than elsewhere, illustrated by a 1988/89 epidemic in the capital cities of Ethiopia, Sudan and Chad. An analysis of the health and health care situation in Luanda, Angola, has shown a growing malaria problem among the poor with a wet season parasite rate of 42% among 5-9 year old children and increasing rates of drug resistance (Kanji and Harpham 1992).

Injury is usually among the top five causes of hospital admission, often the result of road traffic accidents and interpersonal violence—both

common in urban areas. Injuries are a particularly prominent cause of death and morbidity in young adults, as has been shown in Brazil (1988), and factors associated with high injury rates in children have been studied in Rio de Janeiro by Reichenheim and Harpham (1989). Occupational injuries are quite common and so far rarely subject to preventive measures; notification of occupational disease and injury is hardly ever done (Jinadu 1987). A review of the published literature on unintentional injuries in developing countries was published a couple of years ago (Smith and Barss 1991), and an analysis of the injury situation in sub-Saharan Africa has just been published (Nordberg 1994). It includes estimates of injury rates and related deaths, shown in table 6.

Table 6: *Estimated incidence of injuries and injury-related deaths in eastern Africa*

Cause of injury	Annual incidence per 100,000 pop.	Deaths per 100,000 pop.
Falls	10,000	15
Road traffic accidents	5,000	25
Burns	5,000	10
Poisoning	5,000	10
Drowning, near drowning	100	5
Assault	5,000	15
Suicide attempt	1,000	10
Other	9,000	10
Total	40,000	100

Malnutrition is widespread in low-income groups both in rural and urban areas, and it is possible that severe malnutrition is more common among the urban poor than among the rural poor. This is the case for instance in Ivory Coast (Kerejan 1981) and in central America, while in Egypt higher rates of stunting were observed in poor rural households (Brink et al 1983). It is possible that much of the variations and inconsistencies are due to different sampling methods applied. Estimates that 65% of Mathare Valley children in Nairobi are malnourished illustrate the size of the problem (UNICEF and GoK 1988). Breast-feeding is interrupted earlier in urban than in rural areas. Girls in urban slums tend to be less well fed than boys, at least in India (Editorial, *Br Med J* 1988).

Mental illness is probably more common in urban shantytowns than elsewhere, partly due to migration of mentally ill from rural areas to more tolerant environments in large towns and aggravated by weak family support. This assumption is supported by studies of urbanization in Khartoum, Sudan (Williams 1990). Alcohol and drug abuse, causing much mental illness, is particularly widespread in urban areas, and the general stress of urban life is provoking mental

illness in vulnerable individuals. Specialist psychiatric care and treatment is concentrated to the larger cities which may also attract people with chronic or recurrent mental problems. However, such care is economically inaccessible to most low-income urban dwellers.

There are large inter-area differences as regards child nutrition, infant mortality rates, educational levels, duration of breast-feeding and other health-related variables (UNICEF and GoK 1988). A study in squatter areas of Amman, Jordan, found correlations between infant mortality and the mothers education, housing quality, occupation of household head and income (Tecke, Shorter 1984). There are of course also considerable differences in vector-borne disease depending on the local presence or absence of vectors. Less is known about morbidity and mortality differences between parts of African cities although we are generally aware that there are extreme differences between rich and poor urban dwellers. This has been demonstrated for instance by Basta (1977) who found infant mortality rates three times higher in the Manila slums than elsewhere in the city; tuberculosis was nine times and diarrhoea twice as common in the slums. Urban health problems have been described also by Ebrahim (1984), by Kloos (1987) and by Rossi-Espagnet (1984).

Low-income groups in urban areas are standing with one foot in the traditional society and one in a developing industrialized environment. Their health problems stem from both—a mix of undernutrition, infections, intestinal parasites, urban pollution, STDs and accidental injuries associated with unsafe workplaces, just to take a few examples.

Health status differences between the urban poor and the rural poor are a matter of much debate. It is widely agreed that malnutrition tends to be more common among the urban poor, partly because they cannot maintain a kitchen garden and because food prices in towns tend to run away from most salaries (Nelson and Mandl 1978). Early weaning, excessive dilution of powdered milk, and too few meals per day also contribute.

Tuberculosis has been found much more common (five times) in towns than in rural areas (Coulibaly 1981), and the prevalence of *Ascaris* in Soweto has been found seven times higher than in rural areas (Richardson 1969). In the slums of Port-au-Prince, the capital of Haiti, infant mortality was found to be three times higher than in rural areas (Rodhe 1983), and AIDS is also particularly common in large cities.

A few studies on intra-urban area variations have been done in Africa. Excess child mortality in low socio-economic areas have been found in

urban Nigeria by Oni (1988). Hookworm infestation in Dar es Salaam was significantly higher among the poor (Killewo et al 1990). The same was found for ascariasis in South Africa (Elsdon-Dew 1953) and in Lagos, Nigeria, 95% of slum school students were infested with helminths as compared to 52% in a group of rural school children (Fashuyi 1988), but conflicting results have been obtained elsewhere. Diarrhoea in Addis Ababa was twice as common in a low-income area (Kloos 1987). Studies of this kind are surprisingly few considering their importance and the convenient access to urban populations for study. It is also possible that data are available but not much used to measure socio-economic differences in mortality, morbidity and nutrition.

It has been noted by Basta (1977) that urban health statistics look relatively satisfactory partly because squatters and slum dwellers, often legally non-existent, are not represented. They tend to escape sample surveys and may be reluctant to volunteer. It is important, therefore, that health indicators used to describe and evaluate health problems and trends in different groups (WHO 1981) are selected so as to identify risk groups and risk factors. Patients seeking care at health facilities are obviously a self-selected group, unlikely to reflect the disease burden or the actual disease pattern in the area. Still, their disease conditions—or, rather, their assumed disease conditions—crudely indicate the ill-health in the catchment area. The six-months statistics from a health centre in Lunga-Lunga, a Nairobi shanty town, is shown in Table 7, but we don't know to what extent additional cases were managed at home or brought elsewhere for care.

Table 7: *Medical conditions found in self-selected new patients visiting Kahawa HC, LungaLunga, Nairobi, Sept 1986-Fe6 1987*

Respiratory Tract Disease	3775	49.9%
Malaria	734	9.7%
Diarrhoea	577	7.6%
Diseases of the skin	527	7.0%
Accidents, fractures, bums	378	5.0%
Eye infection	377	5.0%
Rheumatism, joint pains	312	4.1%
Intestinal worms	151	2.0%
Gonorrhoea	110	1.5%
Fever of unknown origin	80	1.1%
Malnutrition	63	0.8%
Ear infections	55	0.7%
Anaemia	36	0.5%
Measles	28	0.4%
Pneumonia	27	0.4%
Abortion	23	0.3%
Mental disorders	9	0.1%
Chickenpox	8	0.1%
Dis. of puerp & childbirth	1	0.01%
All other diseases	395	5.2%
Total	7566	100%

Source: Okello 1990

Household health surveys can provide a more accurate picture of the situation, but the sampling then has to be carefully conducted if the lowest income households and individuals—which may be officially non-existing—are to be included.

Household health survey in two Nairobi squatter areas

Kahawa and Mukuru are two squatter areas in north-east Nairobi and south of the city centre respectively. In one Kahawa village with a population of 6,000, and in six villages in Mukuru, 506 households were surveyed by AMREF after cluster sampling.

The population was young, 61% of the adults are between 20 and 29 years and less than 1% are over 45. 52% are immigrants from rural areas. One third of them have stayed 1-4 years in the area while another third have stayed longer. Families are relatively small (average 3 members per family). Most women are housewives (44%) or engaged in small business (selling food, baskets, charcoal etc.). Some are engaged in brewing, some in prostitution. Of the men 63% have salaried jobs while others are self employed. Their income is stated to be insufficient, but an average income could not be determined. The main expenditure is on food (1,000 KES/month) and the lowest on health (63% receive free medical care). An average of 300 KES/month was spent on rent. Over half of the households are tenants. There is a higher proportion of owners among women headed households.

The squatters have failed to win recognition from the Nairobi City Commission and from the central government. However, the squatters are protected by a government dictum stating that registered squatters will not be removed until alternative sites have been found for them. Also the government cannot evict them on behalf of private plot owners.

70% of the houses are constructed with clay walls and floor with a roof of corrugated iron sheets or tin sheets. Most families occupy a single room and 90% cook within the same room. 95% of the households have tap water within the compound and 51% use 60-80 litres of water per day (= 20-25 l/person/day). 61% claim that drinking water is normally boiled and stored. 73% report it to be stored in a container that is washed daily. 60% of the households have excreta disposal facilities, mainly pit latrines (43%) while 2% have flush toilets; 31% have no excreta disposal facilities. Waste water is either disposed in common open drains (46%) or discarded indiscriminately outside the house.

The main problems facing members of these communities were identified as:

- insecurity of tenure
- poverty
- unemployment
- unhealthy environmental conditions
- high population growth and consequent overcrowding

Source: AMREF Child Survival Baseline Survey of Nairobi Slums, Nairobi 1990

4. HEALTH CARE SERVICE

In big cities and large towns the health care system is dominated by large hospitals—public or private—providing relatively high-technology, curative care largely for the urban well-to-do. In many cases this reflects a past colonial system, with discrimination based on race, culture and socio-economic factors (Doual 1981). This does, however, apply not only to countries with a colonial past but also to other developing countries. The presence of these large institutions is a result of extreme inequalities in developing nations with influential, affluent urban minorities having medical care needs much different from those of the large low-income groups. This state of affairs has hampered the development of a balanced health service infrastructure, and it is hard to find good networks of health centres and dispensaries in Third World cities. As noted in case of Nairobi by Lamba (1994), the City Council under-serves the poverty areas, and those council facilities that exist tend to be established outside rather than inside the informal settlements. The urban service system has a strong curative bias (Harpham et al 1985), and the serious environmental and nutritional problems in the shantytowns are left largely unattended. It is rarely actively involved in local primary health care development (Hardie 1984). Reviews of primary health care development in urban areas have been presented by Rossi-Espagnet (1984) and by WHO (1984). The economics of hospitals have been examined in two articles by Mills (1990).

The first-level health care facilities, for example urban health centres, are discussed in a recent publication by WHO (1992), introducing the concept of "reference health centres", an additional level in the system which can be questioned. Public health services are supplemented by private care providers which are particularly common in the towns in the form of private medical practitioners, traditional healers, pharmacies, private hospitals, nursing homes etc. Typical for all these is the neglect of preventive programmes and environmental improvements in their respective catchment areas.

Externally supported projects often aim to adjust this imbalance, and Laquian (1983) concludes that "health programmes in most projects have stressed preventive rather than curative programs, environmental rather than disease aspects

of health, and long-term rather than immediate health needs". But, as noted by Kanji and Harpham (1992) regarding Luanda, the resources needed for a significant and general water supply, sanitation and nutrition improvement are not available, and the client-perceived quality of health services is poor.

Health care utilization in 1,500 urban households in Accra, Ghana, have been studied by Fosu (1989) who concludes that urban health problems have been relatively neglected although a large proportion of the limited resources is allocated to urban care. He points out the importance of poor health as a major predictor for use of all types of health care services and is concerned with inequitable access to care. "What is needed is a radical, innovative, low-cost alternative to the current expensive, curative-oriented approach, which reaches too few people." The need for painful reallocation of scarce resources has been emphasized by Rossi-Espagnet et al (1991) who suggest the following ways to be considered:

- increase the efficiency of and liberate resources from secondary and tertiary health facilities and services to reallocate them to the primary level;
- obtain and wisely use bilateral and multilateral external cooperation funds;
- elicit contributions (of different kinds) from local communities.

Good descriptive studies of urban health care systems and their users in sub-Saharan Africa are not available. A review of the published literature on urban health care in developing countries has been presented by Atkinson (1993). We particularly need to know more about how low-income households use—or fail to use—existing public and private care providers, how different urban households spend scarce resources (money, time, home-care by family members) on different kinds of health care, and how they perceive the quality of care and services obtained. Such studies are justified in small and medium-sized towns as well as in big cities.

5. SHELTER, WATER SUPPLY AND SANITATION

Shelter

One of the main concerns of this study is the relation between the health of the urban poor and their housing conditions. "Housing" here includes the provision of shelter, water supply, sanitation and drainage.

The more important requirements for healthy housing are, according to WHO (1987):

- adequate and safe water supply, sanitary excreta disposal and adequate surface water drainage
- solid wastes management
- health education
- adequate supply of structurally adequate shelter
- food hygiene and preparation
- protection against air pollution indoors
- protection against thermal hazards
- protection against excessive noise
- adequate siting
- access to community services
- meeting special needs for elderly, handicapped etc.

If basic requirements of these kinds are not met, the health status of the population will suffer. The same report indicates that the aspects of housing especially associated with diseases and health hazards are water supply and sanitation facilities.

Well planned, low-cost housing schemes improve the health of the community, not so much because of better accommodation but because the amenities and facilities that go with them — water, sanitation, access to employment, and education.

Tabibzadeh et al 1989

Most governments have been reluctant to spend scarce capital resources on housing. For a majority of households land for self-help construction is not available or is too expensive. As a result they have no alternative but to live illegally in self-built settlements or in dilapidated tenements and shanty-towns. Such settlements are not a temporary phenomenon brought about by a dysfunction in the development process but rather a permanent feature of the urban scene, being the product of very low wage levels and the inability of governments to make housing available for the urban work force (WHO 1987). Services such as piped water, sewage and

drainage systems, garbage collection, schools and formal health care services are not provided to illegal settlements as this would be interpreted as some degree of recognition of the illegal housing.

Housing according to official norms and standards is almost always unaffordable to the poor. Poor households construct their own shelters—often illegally, on land intended for other purposes or on polluted and dangerous sites. An important consideration for poor households is the need to live close to job opportunities. The houses are built with whatever materials are available. When bulldozed by law-enforcing municipality squads they are usually rebuilt. The households try—and usually fail—to obtain public services such as water, electricity, drainage, excreta disposal and garbage collection.

The excessive official standards are due to a combination of factors forming what Gakenheimer and Brando (1987) call an "unintentional conspiracy": A set of mutually reinforcing behaviour in which engineers seek substantial, modern solutions, in which responsible government agencies seek the safety of strong, "failure-proof", "maintenance-free" construction, and in which policy actions required to change standards are not taken because of a tendency for elected officials to leave them to technicians and to avoid a sense of "demodernizing" the service. A well-educated professional elite, trained in a western tradition and in established technologies and disliking minimum standards and professional compromise, have a heavy influence on policy and legislation. Technical professional fees, usually calculated as a percentage of project costs, are also contributing to high technology solutions and to maintaining high and expensive standards. Suppliers of equipment have a similar preference for high technology solutions. There are good reasons to avoid large contractors with vested interests in high technology; to remunerate for actual work done rather than on a project value percentage basis and to give priority to labour-intensive implementation methods. In a situation where local interests are in conflict there may be opportunities for donor agency representatives to help promote appropriate technologies.

Most of these "illegal" settlements are tolerated by the authorities but some are pulled down. It can be argued that the "illegal" schemes are

more appropriate, given the level and regularity of income, household composition, local climate etc., than those meeting government legal requirements. These requirements largely reflect European values and standards. They were introduced to serve the colonial power and to provide its administrators with segregated, low density, well serviced residential areas. The pattern set by the colonial powers has in many cases survived 30 years of independence as shown by the example of Nairobi where 60% of the urban area is set aside for the rich while the poorest half of the population lives on 20% of the area (Barnow 1983).

Housing standards above certain minimum requirements will not necessarily lead to health improvements.

Many so-called low-income housing projects have resulted in the displacement of the urban poor and their replacement by relatively well-off families. Thus the poor remain badly housed and may even become poorer. It is essential to reduce requirements for housing standards to realistic levels and to provide affordable housing units that can be gradually improved. In Nairobi, for example, a non-governmental organization helped slum dwellers to build their own houses at a fraction of the cost of a major governmental and international scheme nearby. Leaving aside the obvious advantages of lower costs, there is proof that, once certain minimum requirements are fulfilled, more expensive housing will not necessarily produce better health.

Tabibzadeh et al 1989

Laws, rules and regulations may to some extent help maintain certain minimum standards but they raise the *cost of housing* beyond the resources of low-income households. They may also be purposely used to discourage affordable housing for the poor and to make many of their efforts illegal. This illegality exposes slum dwellers to the risk of eviction and to exploitation by landlords, police, businessmen and others (Hardoy and Satterthwaite 1989; McAyslan 1987). Governments often use these inappropriate "standards" to estimate the amount of "substandard" housing, and it is obviously wise to be sceptical to such estimates which are often presented to potential donors.

Security of tenure is important for squatters who may wish to improve their shelters and have some means to do so (Harpham and Stephens 1992). It is understandable that poor households are reluctant to invest their meagre savings in property that is not legally theirs and which could be bulldozed any day without compensation. It is remarkable that WHO in its list of "important requirements for healthy housing" (WHO 1987) makes no reference to the crucial question of tenure and to legal rights of tenants to remain on the allotted piece of land

and to enjoy the benefits of whatever development or improvement he or she has contributed. Any future donor involvement in housing programmes may require conditionalities with regard to tenure, and there is need for descriptive studies of current practices and legislation prior to any involvement in support to urban housing schemes.

The scarcity of land and the continuous in-migration of poor people have generated a variety of rental and sub-rental systems. Low and irregular income is forcing people to accept the cheapest possible accommodation, usually a small rented space in a low-quality, illegally constructed house. Houses are increasingly subdivided into smaller units—with little or no access to services such as water, latrines, kitchen, electricity—and in extreme cases people are even renting a bed for a certain number of hours per day, thus maximizing the landlord's profits. In some unauthorized settlement areas, e.g. in Kibera, Nairobi, some buildings have been threatened with demolition while a few landlords have managed to obtain permission to put up buildings for rental. This has increased the number of absentee landlords, some of whom control over a hundred rooms (Amis 1984).

A possible explanation of the preference for rented housing and for a reluctance to invest in private housing in urban Africa is the strong attachment of urban dwellers to their rural home and their intention to return there sooner or later (Andreasen 1990). Household investment is rather allocated to the rural property, if any, and the facilities there certainly help support a temporary stay in the town. The willingness to invest in urban housing is much stronger among those who do not own rural land.

Housing *density and crowding* is linked to communicable disease transmission, fire risk, levels of pollution and degree of privacy. Building codes therefore tend to regulate sizes of plots, dwellings and rooms.

Kenya's Building Code contains "Grade II by-laws applicable to non-permanent houses of minimum space standards in urban areas. The Grade II by-laws do not set standards for water supplies and excreta disposal. These are instead regulated in the Public Health Act, which is applied equally in high and low income housing areas by public health authorities.

Over the past few decades three general policy responses to shantytowns have emerged. These policies have been described by Rondinelli (1988) to be either *laissez-faire*, *restrictive* or *supportive*.

In their efforts to apply supportive policies municipalities and national governments have tried four approaches (Eygelar 1977):

1. complete housing in permanent materials, **piped** water with house connections, sewerage etc.;
2. complete housing in traditional materials (and simple water supply and excreta disposal facilities);
3. site and service schemes (land with services **provided** but allottees build their own houses according to agreed standards); and
4. "site only" schemes (unserved land).

To this can be added

5. rehabilitation and upgrading.

The first approach, in the form of heavily subsidized public housing, was used until the 1970s. By and large, this approach failed. Limited funds meant that it could not reach the bulk of the urban population. Illegal shantytowns became the predominant source of new housing (Mayo 1986).

The typical outcome of "low-cost public housing" schemes appears to be that only a small fraction of the planned houses are actually built, that they turn out to be several times as expensive as expected, and that they are eventually occupied by middle-income families.

The second approach is in most cases not feasible. In urban areas traditional materials like thatch, cow dung and timber poles are not easily available and may even be as expensive as modern, permanent building materials.

For low-income groups the only options are no 3 and 4. The tendency from the 1970s and onwards has been to apply the third approach. Most of the urban shelter projects in the World Bank's lending programme have been of this

In Asia, where a high percentage of site and service schemes have failed, the emphasis has moved to upgrading. This approach, under the name of "conservative surgery", was advocated by Patrick Geddes in India already in the beginning of the century (Geddes 1918), and by John Turner et al (1972) in Latin America fifty years later.

When dwellers control the major decisions and are free to make their own contributions in the design, construction, or management of their housing, both this process and the environment produced stimulate individual and social well-being. When people have no control over nor responsibility for key decisions in the housing process, on the other hand, dwelling environments may instead become a barrier to personal fulfillment and a burden on the economy.

Turner (1972)

The problem of shelter for the urban poor is basically political and institutional (Rodwin 1987). The central issue is that of security of tenure.

Water supply

The provision of urban water supply and sanitation has been one of the objectives of the International Water Supply and Sanitation Decade (1981-1990) proclaimed by the UN General Assembly in 1980. The African urban water supply coverage achievements of the Decade are summarized in table 8 (United Nations 1990).

Table 8: *Urban water supply coverage in Africa 1980-1990, and expected coverage for year 2000 at current rate of progress (population in millions)*

	population	% coverage	served	unserved
1980	119.77	83	99.41	20.36
1990	202.54	87	176.21	26.33
2000	332.49	76	253.01	79.48

According to these figures, the percentage of people with safe water supply increased slightly during the Decade. But the number of urban residents without safe water supply increased during the same period by six million (29%). The estimates for year 2000 indicate that although another 76 million people are expected to be provided with safe water during the 1990s, there will be more than three times as many urban residents without access to safe water by 2000 as there are today.

Middle- and high-income areas have piped supplies with multiple in-house taps and water borne sanitation with consumption levels of 50-150 litres per person per day. The situation in low-income areas is quite different. At best there may be a yard tap or communal standpipes allowing 10-30 litres per person per day. Those not served by the public system have to draw water from any source available: streams, ponds, wells and rainwater tanks. Or they may have to purchase water from itinerant vendors at very high cost per litre, or from water kiosks.

Addis Ababa has a population of well over 2.2 million. The official coverage rate for water supply is about 97%. There are 120,000 individual connections and some 250 public water points (Liurn 1992). This means that each public water point has to serve on the average more than 8,000 persons! (During the last few years the situation has turned even worse due to an influx of displaced persons and demobilized soldiers.)

Some peri-urban squatter areas with over 5,000 people, for instance in Nairobi, have no water collection points within its boundaries, and others have only a limited number of standpipes. Water consumption in such areas is often less than 15 litres per person per day while two or

three times this amount is required for a reasonable level of hygiene and reduced water-related ill-health. At 10—15 litres per day most of the water is used for drinking and cooking and only a minimum for washing. Baths or showers are out of the question and clothes remain dirty for days and weeks. The following embarrassment hampers social contacts and job seeking. The hygienic, social and psychological effects of severe water scarcity have been pointed out, e.g. by Hollsteiner (1979).

The 87% coverage figure in table 8 presents too bright a picture of today's situation. Urban water supplies in Africa have a number of severe problems:

- The cost recovery is far below what is required to finance operation and maintenance. This is due to a combination of factors including lack of political will, inefficient procedures, corruption and unauthorized connections.

Increasingly it has been recognized that supplying free water does not necessarily ensure greater equity. Limited resources make it impossible for entire populations to be reached and those most likely to remain without access to clean water or adequate sanitation are the poorest and most vulnerable sections of the population. "Free" water often ends up being more costly to the poor than to the rich in terms of time and energy lost in obtaining adequate sources of drinking water, and, for some severely affected areas, in terms of money required to buy from private vendors during water-scarce seasons of the year. Moreover, large-scale subsidies that are involved in providing free water often undermine financial discipline, lead to higher overall costs and result in inefficient use of scarce resources. As a result of difficulties encountered from relying on limited government resources for the long-term sustainability of water and sanitation services, the need to recover costs from alternative resources, i.e. the users, has become imperative.

Garn 1990

- The capacity of the water supply systems is generally far below what is required. Substandard performance is often the result of a gradual expansion of the system beyond its capacity. Most supplies operate intermittently, providing water for only part of the day. This leads to contamination of the water and to long queues at public standpipes.
- The treatment of the water is sometimes badly done due to lack of funds, spare parts, chemicals and/or human resources.
- Leakages of between 30% and 60% of the water treated and pumped into the system exacerbated by numerous unauthorized connections to the water mains made by private individuals (Hardoy et al 1990).
- Lack of maintenance—a general problem for publicly owned infrastructure in Africa.

The increasing relative water scarcity in sub-Saharan Africa calls for sanitary and hygienic—as well as industrial—solutions which minimize water consumption, protect ground and surface water sources and facilitate water recirculation. This means a preference for dry (pit or composting) latrines, roof catchment and protection of surface water.

Most of the East and some of the South African countries will be water stressed already by 2000, and eight of them will have arrived at absolute scarcity by 2025.

Falkenmark 1989

At present most urban households in Africa use non-flush latrines. Increasing water scarcity will make it impossible to provide these households with flush toilets requiring an additional 200 litres of water per household per day

Roof catchment of rainwater is possible but not commonly practised. In the future many more urban households will have to rely on catchment and storage of rainwater. The protection of surface water from faecal and industrial pollution must be given a high priority. Ground water is often of better quality but is also exposed to possible chemical as well as microbiological contamination from garbage dumps, pit latrines, industrial waste water effluents and through insufficiently covered well-tops. Where such contamination has already reached harmful levels, ground-water sources may have to be abandoned in favour of piped supplies from safer sources elsewhere, possibly combined with rainwater harvesting.

Water standpipes within 50-100 m from any house and water provided at rates affordable to the poorest should be a minimum requirement. Until this service level can be achieved a system of legalized water vending should be introduced. Preferably through women's groups as has been done in Kenya. Roof catchments and household storage tanks tend to be more expensive than standpipe systems but do provide an invaluable back-up when the standpipe system breaks down. Another advantage is that roof catchments can be operated and maintained by the users. The next upgrading level would be yard taps, combined with simple waste water drainage possibly combined with evapo-transpiration beds and/or the irrigation of kitchen gardens.

High water consumption (150-250 litres per person per day) in high- and middle-income areas can be reduced to less than 100 by reducing water flow (from 20 to 30 litre/minute to around 10 litre/minute), repairing leakages, improving preventive maintenance of the system and gradually replacing ordinary cistern flush toilets with low-volume flush toilets or dry latrines (VIP, ROEC, LASF or composting latrines, see

Winblad 1985). This cuts costs, facilitates a more equitable use of an increasingly scarce resource and minimizes the problem of waste-water management.

Priority should be given to the implementation of an equitable pricing system based on a policy of a high degree of cost recovery.

Another priority area is that of capacity building of agency staff and private entrepreneurs.

Sanitation

In urban areas sanitation is a much more difficult problem than water supply. Table 9 summarizes the coverage achievements of the Decade in the field of urban sanitation in Africa (United Nations 1990).

Table 9: *Urban sanitation coverage in Africa 1980-1990, and expected coverage for year 2000 at current rate of progress* (population in millions)

	population	% coverage	sewed	unserved
1989	119.77	65	77.85	41.92
1990	202.54	79	60.01	42.53
2000	332.49	73	42.17	90.32

The UN figures indicate that 82 million urban residents in Africa were provided with "satisfactory sanitation" during the Decade. The number of people without sanitation remained constant, however. The estimates for year 2000 indicate that although another 82 million people are expected to be provided with sanitation during the 1990s, there will be more than twice as many urban residents without access to sanitation by year 2000 as there are today.

The Decade report (UN 1990) does not define the criteria for "served" used in compiling the statistics for table 9. This category probably covers a wide range of solutions, from family flush toilets connected to public sewers or private septic tanks to traditional pit latrines shared by a number of households². In our experience the number of households categorized as "served" **tend to be exaggerated.** The previously quoted UNDP-World Bank report (Liurn 1992) gives the urban sanitation coverage for Addis Ababa as 60% but hastens to add "However, a large (unquantified) proportion of the installations are not in a condition that could be termed 'sanitary'

² The problem with shared latrines is illustrated by a recent report on Accra (Bennehet al 1993) where 36% of households use flush toilets but almost half of the households share toilets with at least ten other households.

or 'satisfactory'. Thus the situation in urban areas is probably much worse than indicated by coverage figures." Even so, the official statistics make clear that an increasing number of urban residents lack access to even the most simple form of latrine.

Satisfactory sanitation is particularly important for the urban poor as they often live in densely populated areas. Their problems cannot be solved by conventional sewerage or small-bore sewers. Water-borne systems are expensive to install and operate even under the most favourable conditions (see Table 10). In a typical African urban area with a fast growing population, lack of funds, irregular settlement pattern, water shortage, the use of solid objects for anal cleaning and lack of recipients for treated or untreated sewerage, conventional sewerage is not even an alternative to consider (Winblad 1974, Kalbermatten 1980). Nor is a system depending on vacuum trucks. Mechanical emptying of latrines requires complicated equipment which is expensive, has to be imported, is oil consuming and requires a lot of maintenance. A third world country selecting a technology of that type increases its dependence on the industrialized countries. Besides, mechanical emptying, to the extent that it can be made to function, takes away jobs for unskilled labour.

Dar es Salaam established its sewerage system between 1955 and 1959, initially with an outlet to the ocean north of the harbour. The pipes are now in poor shape, broken and leaking, some blocked. Later, some other systems with waste stabilization ponds, were established for residential, institutional and industrial developments. Few ponds were in proper operation a few years later. By 1985 about 78 % were using pit latrines, 10 % used septic tanks and 12 % were sewed by sewerage. The City Council established a Sewerage and Sanitation Department in 1982. The population was then about one million, there were some 60,000 latrines and 9,000 septic tanks. The department was to be responsible for sewer maintenance and repairs, VIP latrine construction and pit and septic tank emptying. The cost of emptying of septic tanks was US\$2-4 per plot in 1985, but services were severely constrained due to lack of both staff and budget. Overflowing latrines are a serious problem during rains and emptying services are grossly inadequate. (Cherkosiel1993)

A recent study of 205 households in the Kibera Division in Nairobi gives the following information: 99.5% use pit latrines 94% share their pit latrine with other households (by as many as 20 households), 10% of the households do not know how many other households share their latrine.

Excreta disposal problems in Addis Ababa

During a seminar for sanitarians in Addis Ababa in 1980 the participants were asked to list major problems (A more recent, January 1993, seminar confirmed that the problems remain, now magnified by rapid population growth.):

- Insufficient number of latrines. Usually 3-30 households share one pit latrine or cesspool.
- Nobody takes the responsibility for cleaning and maintenance of a latrine that is shared by several households.
- The housing density is in many parts of the city so high that it is no longer possible to find a suitable site for a latrine, or to dig a new pit when the old one is full. A common system in the crowded parts of the city is to deposit faeces in a tin can, put it aside until dusk and then discreetly empty it at a 'suitable' place in the neighbourhood.
- The groundwater table is in certain parts of Addis Ababa so high that conventional pit latrines cannot be used. In other parts of the city the sub-soil consists of bedrock which makes the digging of pits impossible. In other parts of the city pits tend to cave in due to unstable soil conditions.
- In areas with relatively new houses and WCs, the sewers are run directly to nearby streams, bypassing the septic tanks.
- Effluent from septic tanks is often drained into storm water channels.

From Winblad, U (1980). Sanitary problems in Ethiopia—a travel report to SIDA, Stockholm

Table 10. Typical range of capital costs per household of alternative sanitation systems (1990 prices)

	US\$
Twin pit, pour-flush latrine	75-150
VIP latrine	68-175
Small-bore sewerage	150-300
Conventional septic tank	200-600
Conventional sewerage	600-1200

Source: Hardoy 1990

For urban and peri-urban low-income areas in Africa there are as yet, for individual households, no alternatives to rural-type solutions: traditional pit latrines, VIP or ROEC latrines, bucket latrines and various types of twin-pit or double vault (dry-box or composting) latrines. It is possible to adapt some these technologies to high, even very high, densities, as shown by current projects in San Salvador and Mexico City (Winblad 1994).

An alternative to be seriously considered for urban areas is on-site sanitation combined with re-use of human excreta and household refuse in horticulture and agriculture. This in turn means urine separation, composting latrines, frequent collection of urine and occasional collection of compost. The output of such a system—urine and compost—has a potential market value (Mena-Abraham 1991). In a low-income country this value might even be higher than the collection and transport cost—there is no a priori upper limit. Urine and faeces processed separately are much easier to handle than sewage. There is no need for access by motor vehicles. Simple cartage systems can be used instead of vacuum trucks (Rijnsburger 1990).

Communal (public) latrines have a bad reputation (poor privacy, poor cleaning and maintenance, poor accessibility) but might be the only option where private solutions are unaffordable or impossible to accommodate due to lack of space. In such cases there must be an adequate

number of public or shared latrines available. If there are too few, queues become long and accessibility declines (Benneh et al 1993). The employment and supervision of a cleaner or a full time attendant is a prerequisite if a communal latrine is to function satisfactorily.

Drainage

Drainage, the removal of unwanted water from human settlements, may have a potential impact on health and well-being.

Failure to provide adequate drainage is directly linked to the resurgence of malaria, the spread of diarrhoeal disease, damage to housing and property, disrupted communications and environmental degradation. The costs are not evenly shared across society, but fall most heavily on women and children among the urban and rural poor. (Kolsky et al 1991)

Drainage should therefore be an essential component of an integrated programme of environmental sanitation.

Solid waste disposal

Solid waste disposal (household waste, commercial refuse, institutional refuse, street sweepings, construction debris and industrial waste) is an expensive urban service absorbing some 20-40 percent of municipal revenue (Cointreau 1982). Most of this is spent on transport. Low-income housing areas have hardly any space for storing garbage, are hardly served at all and are characterized by stinking heaps of rotting garbage, attracting dogs, pigs and birds and generating plenty of flies. Sewers, if any, are usually blocked, and dustbins, if any, are overloaded and rarely

emptied; "illegal" houses are obviously not well served or served at all by municipalities. Such houses do not meet agreed building code criteria, with risk of demolition whenever the legislation is to be strictly enforced. The composition and energy content of refuse varies with socio-economic status of the household and to some extent with the season. Recycling of reusable material is common in poor households and keeps the solid waste volume down, particularly if combined with on-site or neighbourhood composting of digestible refuse. Dustbins must be provided in proportion to the number of people in each house, health education must be arranged, and laws must be enforced. Markets and shops need their own dustbins. Collection is infrequent and irregular, particularly in low-income areas where, therefore, on-site composting and the keeping of pigs, goats or other refuse-eating animals should be considered.

Trucks and other motor vehicles are less and less affordable. Street-sweepers combined with donkey-carts, hand-carts or wheel-barrows with portable bins have proved useful in many Asian cities, and tricycles are used in many towns (Pickford 1984). Such non-motorized modes of transport could be used for short range transfer of refuse to permanent communal storage sites or to a larger motorized vehicle. Any improvement usually requires household behaviour change and, thus, community participation, but such cooperation is more easily established if local priorities are respected. If these include drainage, latrines, paved roads, lighting, there may be little problem—particularly if some degree of cost-sharing is acceptable. If other priorities are expressed, other service sectors than health may have to be involved.

Local or on-site composting should be encouraged in view of the potential savings, the usefulness of compost as fertilizer and the high vegetable content of most household refuse (over 75% in India; as compared to below 30% in Britain).

Toxic waste is generated mainly by industries such as metal processing plants, pharmaceutical and other chemical manufacturing, and textile factories. Safe disposal is inadequate or non-existent, and much of waste is left on site, dumped without permission on vacant land, or simply mixed with ordinary household refuse.

Q, OTHER URBAN ENVIRONMENT ISSUES

Air pollution is a poorly recognized health hazard in different environments, outdoors as well as indoors. Pollution levels are particularly high in urban areas where motor traffic is intense, industrial production concentrated and shelters crowded. Indoor pollution levels are higher than those outdoors, and those who spend much time in the house, women and small children, are more exposed than others (WHO 1992). Prominent pollutants include sulphur dioxide, carbon monoxide, nitrogen dioxide, lead, particulates and various cancerogens such as polycyclic hydrocarbons (for details, included recommended higher limits see UNEP/WHO 1988). They have different effects on the respiratory tract, irritants paving the way for infections, reducing total lung capacity, causing allergic reactions and, in some individuals and after long periods of sustained exposure, cancer. The problem is extremely complex, with many conflicting interests and competing needs. The very poor urban dwellers are the losers. However, domestic indoor pollution is one environmental problem that can largely be reduced by the individual household (McGranahan 1991). Technical countermeasures exist (low-polluting fuels; low-polluting industrial production processes; exhaust control of industrial plants and motor vehicles; energy conservation; etc.) but costs are often prohibitive, and the urban poor may need to acquire more political clout in order to obtain a larger share of the available resources. In his most recent book Poul Harrison (1993) reminds us of the long process of coming to grips with the London smog and the stinking Thames:

It is often surprisingly slow. London suffered the grime and gloom of smog for three centuries before coal burning was banned. For even longer it tolerated the stench of the Thames, polluted with the filth of untreated sewage and later the poisonous effluent of factories. It drew its drinking water from this open drain until the Metropolitan Water Board was set up in 1903. These delays were due to the absence of affordable technologies, or to a lack of understanding of the link between filthy water and disease. Today the linkages and technologies are universally known, and when pollution impinges on the rich and powerful, it is promptly dealt with. But when the poor are victims, action waits until they achieve political muscle through protest, riot or the ballot box.

Low-income urban households are generally more crowded and less smoky than rural ones,

but problems and risks vary widely between different kinds of households. Illegal peri-urban squatter houses are often damp, located along river valleys or otherwise poorly drained, and typically lack electricity, water supply and functioning refuse disposal while a crowded rented and subdivided central city apartment may be fairly served but on the other hand noisy, poorly ventilated and exposed to industrial pollution and vehicle exhaust gases.

Dampness and high levels of air pollution are associated with increased incidence of respiratory infection in small children (Martin et al 1987). Crowding and poor ventilation facilitate transmission of airborne infections such as influenza and other virus infections, whooping cough, tuberculosis and many others. Dampness has an uncertain effect on adult morbidity, however, while air pollution appears to have a significant effect on respiratory illness at any age (McCarthy et al 1985). Associations are rarely clear cut, however, due to a variety of confounding factors at play.

Some settlements are at considerable risk of industrial accidents such as explosions, unintended leakages of toxic materials, and traffic accidents. Adequate safety zones around industries are rarely maintained. High rates of malnutrition, associated with low levels of defence against infection, make poor household members particularly vulnerable and contribute to high rates of infection in low-income settlements.

Many urban work environments are harmful in the sense that they are often highly polluted with toxic chemicals, dark, crowded, noisy, poorly ventilated and accident prone, and also in the sense that employees are relatively poorly trained, inadequately protected and often in poor health, underage and overworked. Harmful effects of the working conditions are added to the impact of an unhealthy home environment, and it may be difficult in any given case to determine the contribution of each of the two. The growing tobacco smoking epidemic in Third World countries are further increasing the harmful effects of indoor air pollution both at home and in the work-place. Social security is unsatisfactory, sick leave is poorly or not at all compensated, and it is difficult to obtain reasonable compensation in case of work related injury or illness. Legislation exists but enforcement is generally weak.

8. CONCLUSIONS

The urban population in Africa is growing rapidly—from 210 million in 1990 to an expected 340 million in 2000. The development of urban infrastructure is not keeping pace and urban environmental conditions are deteriorating. The number of urban dwellers without access to safe water is expected to increase from 26 million in 1990 to 80 in 2000. The number of people without access to an acceptable latrine will grow from 43 million to 90. Less than half, possibly less than a quarter, of all urban household refuse is being collected and safely disposed of. Urban populations consist of extremely diverse subgroups, essentially an affluent, well educated and well-housed minority and a poor majority living under pressing economic and social conditions in poorly serviced and unhealthy shantytowns. However, the social epidemiology in these areas, and the different disease patterns in various urban sub-populations, are not well described, and their health care needs are largely unknown.

Rural and urban development are in many ways linked and interdependent. Households are physically divided between urban and rural areas and their income is often partly rural, partly urban. Solutions to their problems require development in the urban as well as in the rural environment. While most of the poor and vulnerable households will continue for decades to be found in rural parts of sub-Saharan Africa, there is a need for development agencies to increase their attention to the problems of low-income urban households and to such development programmes in both rural and urban areas that are likely to alleviate their situation. These may include educational programmes to empower disadvantaged rural and urban households to secure a fair share of the service output, assisting efforts to establish organizations and institutions to facilitate a more equitable access to resources, and direct support to health-related environmental improvements.

For the time being there are good reasons for donors to continue its present policy of giving priority to rural development. Rural Africa's health and hygiene problems are still largely unsolved and growing. Much remains to be done to increase the coverage, improve the functioning and generate sustainability of rural water supplies. Most remains to be done on rural sani-

tation. Virtually nothing is being done regarding control of disease vectors.

The Nordic donor agencies should therefore continue their long-standing emphasis on rural programmes in the field of environmental hygiene, at least for the next 5-10 years. This policy already includes certain investments in *small and medium sized towns*. As regards health and environmental problems in *big cities* there is a need to monitor more closely the current situation and ongoing development programmes implemented by municipalities, ministry agencies and NGOs, for instance through specific consultancy studies with reports submitted to sector review missions.

With a medium-term perspective, say 10-20 years, we see three main policy options for development assistance:

- Continued stress on rural programmes in the fields of health, water supply and hygiene.
- Continued strong support to rural development programmes, combined with an increased involvement in small and medium sized towns.
- Increased involvement in pure urban projects, also in big cities.

There are essentially three arguments in favour of the first option. First, in sub-Saharan Africa 70% of the population (UNICEF 1994) live in rural areas. Even with rapid urban growth Africa's rural population will go on increasing for the next 30 years. Second, most if not all rural development problems remain unresolved and in need of continued support. With the relatively small and possibly shrinking funds available for development assistance there are at present no strong reasons to divert resources to new urban projects in Africa. Third, the Nordic donor agencies have acquired a considerable amount of knowledge and experience of rural African development which should be applied where most useful.

The second option means that a certain proportion of total resources is diverted from the rural effort. An argument in support of this option is that small and medium-sized towns are so much related to and functionally integrated into the rural development process that they can be seen as an important support factor in need of attention and assistance. It is also possible that such projects would improve our understanding of district and provincial town problems and

constraints for the benefit of future rural projects and programmes.

The average urban dweller has access to resources far in excess of his/her rural counterpart. When SIDA's health assistance to Kenya was evaluated in 1986 it was for instance calculated that the average urban resident consumed health care at an estimated value of KES 200 per year while the corresponding amount for a rural dweller was KES 5. Even if such figures are uncertain there is clearly need for more equity between different urban groups as regards access to public services. However, it is hardly from the already disadvantaged rural people but from the relatively healthy and well-served urbanites that resources should be reallocated to benefit the urban poor.

An important argument in support of the third option is that a donor agency, while continuing to tackle unresolved rural problems, also needs to generate its own urban development know-how, alone or in collaboration with other agencies. Moreover, urban beneficiaries are more easily accessible, and the visibility of urban programmes is attractive both to the recipient government and to the donor agency concerned.

A PHC model for urban shantytowns with strong emphasis on environmental health and hygiene and on reproductive health needs to be developed and tested by municipalities and local community groups.

We recommend modest but long-term support to the formulation, implementation and evaluation of a few urban PHC projects in bilateral programme countries and focused on low-income housing areas. This task might be given to applicant institutions with solid PHC experience, such as municipalities, local NGOs and academic institutions or combinations of these. In Kenya, for example, possible institutions include Nairobi City Commission, AMREF, and the Department of Community Health of the University of Nairobi. In Ethiopia institutional candidates include the Municipality of Addis Ababa, the Medical Faculty of the AA University, and Save the Children Fund.

While some problem components are very similar in different countries and districts, there are local socio-cultural and legal differences and health care systems variations requiring investigation and analysis in their local context. Further research, according to Tabibzadeh (1989), is needed on the following issues:

- the consistency of urban health policies, plans and programmes with the principles of the primary health care strategy;
- intra-urban differentials in health and health services, their determinants, and their implications for the urban district health system;

- the coverage of the poorest areas and population groups by health and other relevant services, and the efficiency and equity of the referral system of the current structure;
- testing local community health development programmes and identification of opportunities and constraints;
- existing urban health legislation and its enforcement;
- roles, training, effectiveness, and potential of urban community health workers;
- the social and medical adaptation of migrants to the city.

We also recommend the Nordic donors to initiate a few studies:

- Data on urban health, health care and service inequities are scarce and shaky. An in-depth study of health self-care, health care provision and service utilization in a few selected urban groups could help identify crucial problems and obstacles.
- A review of non-published data on morbidity and mortality statistics, health related practices and health care utilization in different urban sub-populations; this task could be subcontracted to local research institutions, possibly supported by a backstopping institution in the Nordic countries.
- Low-cost methods for on-site disposal and/or re-use of human excreta, garbage and waste water at high population densities. Most writers assume that there are upper limits beyond which on-site methods must not be used. Is this assumption correct? Where are the upper limits?—The study should specifically consider the problems of multi-million cities with large shantytown populations. (Since this report was drafted SIDA has initiated a research and development study of no-cost/low-cost sanitation.)

Some of the recommended studies can be conducted by local institutions. There is a strong case for helping to develop, in a few countries, an interest in these issues as well as an in-country capability to implement such studies.

To improve the relevance and the impact of future health-related interventions in Africa's growing slums, there is need for close and systematic monitoring of health and environmental projects implemented by government and other agencies. This is a task not only for implementing agencies but also for concerned donor and research financing organizations which have greater opportunities to communicate the results to the international community.

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